

PYCNOGONIDA OF THE WESTERN PACIFIC
ISLANDS V. A COLLECTION BY THE
KAKUYO MARU FROM SAMOA

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Abstract.—A small shallow-water collection of Pycnogonida taken by the Japanese training vessel *Kakuyo Maru* in American Samoa and Western Samoa is described. The collection contains seven species, one of which is new: *Anoplodactylus crassus*. The species affiliations are discussed along with their limited known zoogeography. Little concerning zoogeographic affinities can be proposed due to lack of pycnogonid collections from most mid-Pacific localities.

Pycnogonids of the Samoan Islands have remained unknown until these first records of specimens taken from this locality. There were only seven species collected in two well known shallow-water genera, with six species known and one new to science: *Anoplodactylus crassus*. The six known species have mostly Indo-West Pacific distributions based on what little is known, but one species, *A. erectus*, has been collected many times in shallow waters along the west coasts of the Americas at least as far south as Colombia. This species is also known from the Tuamotus and from Korea, but its apparent main distributional locality of the American coasts makes it the only apparent emigrant from the east in the Samoa collection. One species, *A. perforatus*, has been taken only in Japanese waters, while *Ammothella stauromata* has been taken in the Marshall Islands and the northern and southern Philippines, *Anoplodactylus rimulus* only from the western Indian Ocean, and the other two species, *A. arescus* and *A. glandulifer*, have broader known distributions in the Atlantic and Indo-Pacific. The distributional knowledge of these species is undoubtedly fragmentary, as is that of most pycnogonids, and it will be extended for each species as more collecting is carried out in the vast areas still unsampled. None of the depths at which the six known species were taken

extends the depth distribution for any of them.

Family Ammotheidae

Genus *Ammothella* Verrill, 1900

Ammothella stauromata Child

Ammothella stauromata Child, 1982:271-273, fig. 1; 1988a: 5, 7.

Material examined.—American Samoa: Tutuila; Pago Pago Harbor, 3 m, 23 Oct 1985, 2 ♂ with eggs, 1 ♂.

Distribution.—The type locality for this species is Enewetak Atoll, Marshall Islands, and it has also been taken in the Philippines in the south at Negros Island and in the north at Batan Island, Batanes Province. It is now known to inhabit American Samoa. All capture depths are shallow at 0-3 meters.

Remarks.—This is an easily recognized species in a genus with many similar species. The dorsal trunk tubercles almost match the ocular tubercle and the abdomen size and length, and make this species very distinctive. There are several *Ammothella* species with median trunk tubercles, but none of the others have this tall shape nor does any other species have a tall tubercle on the cephalic segment. Other recognition characters are the short first scape segment with small distal tubercles, anterolateral cephalic

segment tubercles, and dorsodistal tubercles on the lateral processes. None of these characters is unique but their combination in this species makes it unique.

Family Phoxichilidiidae

Genus *Anoplodactylus* Wilson, 1878

Anoplodactylus arescus

du Bois-Reymond Marcus

Anoplodactylus arescus du Bois-Reymond Marcus, 1959:105–107, pl. 21.—Stock, 1968:53 [text]; 1975:133, figs. 10–12.—Arnaud, 1973:954.—Child, 1988a:12.

Material examined.—Western Samoa: Apia; Upolu Island, 10 m, 25 Oct 1985, 1 ♂, 4 ♀.

Distribution.—This species was first taken in the Red Sea in sand and has had subsequent captures in Madagascar and Tanzania. It was recently found in the southern Philippines (Child 1988a), and is now also known from the mid-Pacific in Samoa, much farther east than previous records. This Samoan record marks the deepest capture for this species at 10 meters. The substrate at this locality is fine coral sand with small rubble bits. This species is one of the few pycnogonids known to prefer fine sand as a regular habitat. A few other *Anoplodactylus* species have been taken repeatedly from sand and most species of the genus *Rhynchothorax* are also known from this kind of substrate in at least one or more records.

Remarks.—These specimens have a slightly shorter neck, a second smaller heel spine proximal to the main spine, and the proboscis is more cylindrical than the swollen proboscis of the type. These specimens agree very well otherwise with the figures of the type. The integument is very papillose in all specimens examined. This is a very

tiny species and is recognized by its distally extended tarsus, a round pad of integument at the heel base, a full propodal lamina, and a lack of any auxiliary claws, all characters shared by the 5 Samoan specimens.

Anoplodactylus crassus, new species

Fig. 1

Anoplodactylus viridintestinalis (Cole).—Kim, 1986:3–5, fig. 2.—Kim & Hong, 1986:44.—Hong & Kim, 1987:161.

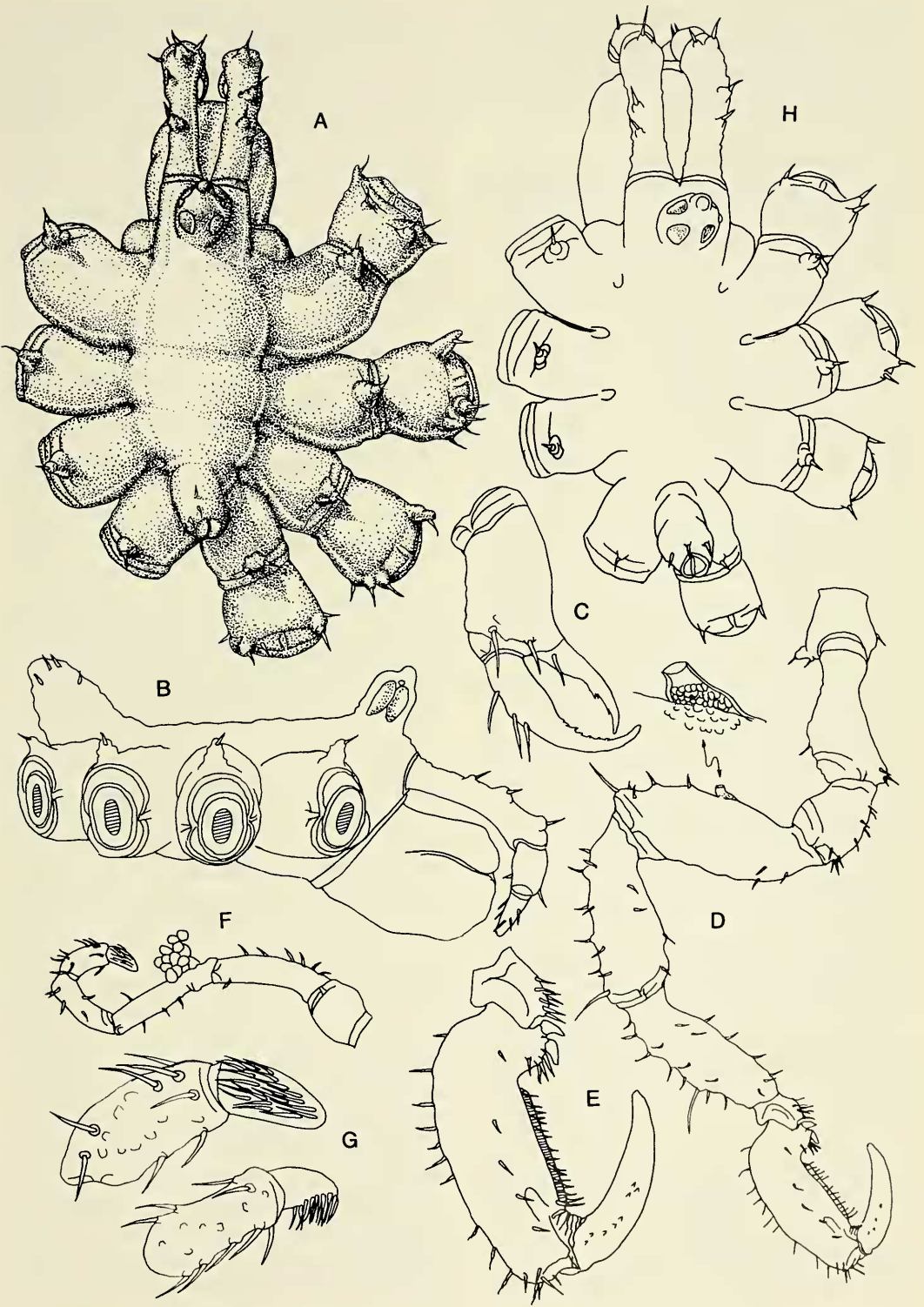
Material examined.—American Samoa: Tutuila; Pago Pago Harbor, 3 m, 23 Oct 1985, holotype ♂ with eggs (USNM 234393), paratypes, 2 ♂ with eggs, 2 ♀, 1 juv (USNM 234394).

Description.—Size moderately small, leg span 8.3 mm. Trunk compact, circular in outline, unsegmented, lateral processes contiguous proximally, slightly separated distally, each armed with small conical dorsodistal tubercle bearing seta. Neck short, flanked by large bulges denoting palp rudiments. Ocular tubercle as tall as its diameter, capped by low anterodistal tubercle, eyes large, well pigmented. Proboscis short, with low midventral swelling. Abdomen broad in lateral view, only slightly longer than ocular tubercle, tapering distally, armed with 7–8 short distal setae.

Chelifore scape slender, 5 times longer than its diameter, armed with 3 low dorsal tubercles each bearing seta. Chela palm narrow, movable finger as long as palm, armed with several tiny serrate teeth and 3 ectal setae. Immobile finger shorter, more slender, armed with 2 tiny teeth. Fingers well curved, movable finger with greater curve, overlap at tips.

Oviger short, setose, second to fifth segments armed with lateral and distal setae,

Fig. 1. *Anoplodactylus crassus*, holotype male: A, Trunk, dorsal view; B, Trunk, lateral view; C, Chela; D, Third leg with enlargement of cement gland tube; E, Leg terminal segments, enlarged; F, Oviger with several attached eggs; G, Oviger terminal segments, enlarged in lateral and ectal views. Paratype female: H, Trunk, dorsal view.



sixth with dense field of short lateral setae on one side only. Second segment subequal to third which has proximal constriction, fourth slightly longer than fifth, sixth a short cone.

Legs moderately short, robust, lightly setose. First coxa almost length of third, first armed with 2–3 short dorsodistal tubercles bearing apical setae. Femur the longest segment, cement gland a single short truncate cone with broad tubular tip. First tibia longer than second, both armed with low dorsal bulges bearing setae. Tarsus triangular with many short endal setae. Propodus with strong heel armed with 2 short stout spines and 3 setae. Sole with many short setae flanking long lamina on entire sole length. Claw robust, well curved, about 0.6 propodal length, auxiliaries entirely lacking.

Female slightly larger than male, dimorphic in trunk shape. Posterior pair of lateral processes well separated from third pair imparting a more ovoid shape to trunk in dorsal outline. Lateral process tubercles and those of first coxae reduced or lacking with corresponding reduction of coxal setae.

Measurements (in mm).—Trunk length (chelifore insertion to tip 4th lateral processes), 0.86; trunk width (across 2nd lateral processes), 0.8; proboscis length, 0.38; abdomen length, 0.29; third leg, coxa 1, 0.26; coxa 2, 0.37; coxa 3, 0.29; femur, 0.71; tibia 1, 0.6; tibia 2, 0.55; tarsus, 0.14; propodus, 0.51; claw, 0.34.

Distribution.—Known from the type-locality, Pago Pago, American Samoa, in 3 m, and from the Korean coast in littoral depths.

Etymology.—The species name *crassus* is Latin (thick, fat, or stout) and refers to the thick or stout appearance of these specimens.

Remarks.—This new species is very close to and forms a geminate pair with *Anoplo-dactylus viridintestinalis* (Cole, 1904). The two species are difficult to separate by superficial examination but close investigation of both sexes in each species shows

many small differences between the eastern and the western Pacific species. Taken alone (as with Kim 1986), these differences could be attributable to variation in populations but examination of the cumulative effect of the many small differences suggests that isolation has produced speciation from what possibly was the original stock on the American west coast. A number of specimens of *A. viridintestinalis* from California (Fig. 2A–F), and the female holotype appendages were examined for comparison with the Samoan specimens. The trunk and its additional appendages in alcohol (not on slides made by Cole) were lost many years ago.

The mainland American specimens show almost no variation among themselves and are consistently different from *A. crassus* in the following characters. The proboscis of *A. crassus* is shorter in length and thicker in diameter than the mainland species. The trunk shape is always broader in dorsal view in males than in *A. viridintestinalis*, and the chelifore scape has 3 low setose tubercles in almost all specimens rather than one or none, the chelae are longer and more slender or rectangular in shape, the abdomen is broader, carried at less of an erect angle, and has more distal setae, the lateral process tubercles each bear a seta at the tip rather than anterolateral to the tubercle itself, the 3 laterodistal tubercles of the first coxae are larger while the mainland species may have only one or none, the ocular tubercle is more rounded distally with a small cap tubercle while Cole's species has a pointed conical ocular tubercle, and the ventrodistal sex pore tubercle on the second coxae is low and inconspicuous while it is as long as half the segment diameter in *A. viridintestinalis*. The cement gland tube, although it has the same bottle shape and location on the femur, is shorter in length than that of Cole's species. It is in the setation of the oviger terminal segment that the biggest difference is noticeable. In the new species, there is a field of many short setae, shorter than the max-

imum segment diameter, which occurs only on one side of the conical segment. On the terminal oviger segment of Cole's species, there are 6 to 8 setae, each longer than the maximum segment diameter, placed randomly on its endal and lateral surfaces.

Sexual dimorphism of the lateral process placement on the trunk is evident in both species but the female proboscis of mainland specimens invariably has a rather large proximoventral bulge which is not found in *A. crassus* females.

It would be rather difficult to separate these two species were specimens of both not at hand with which to compare the differences. The set of figures (Fig. 2A–F) of *A. viridintestinalis* from California is therefore provided so that these differences can be more readily seen.

Anoplodactylus erectus Cole

Anoplodactylus erectus Cole, 1904:289–291, pl. XIV, fig. 12, pl. XXVI, figs. 1–9.—Child, 1970:288–289 [early literature]; 1979:52.—Kim & Hong, 1986:41, fig. 5.—Hong & Kim, 1987:161.

Material examined.—American Samoa: Tutuila, Pago Pago Harbor, 3 m, 23 Oct 1985, 2 ♂ with eggs, 1 ♀.

Distribution.—This species has long been known to inhabit shallow waters from British Columbia, Canada, to Colombia, and it has also been taken in Hawaii, the Tuamotu Islands, and in Korea. This record extends its South Pacific distributional limits westward to Samoa, but adds nothing new to its shallow depth records.

Remarks.—Males of this species are easily recognized by the long subcutaneous cement gland tube extending almost to the proximal end of the femur, dorsodistal lateral process turbercles of varying lengths, the long third oviger segment, and the two short spines on the well formed heel of the propodus. The chelae are short and the overlapping fingers have no teeth. Female

specimens, as with almost all females of this genus, need accompanying males which bear the critical characters essential for positive identification.

Anoplodactylus glandulifer Stock

Anoplodactylus glandulifer Stock, 1954:80–84, fig. 36.—Child, 1982:273–274 [literature]; 1988b:58–59.

Material examined.—American Samoa: Tutuila; Pago Pago Harbor, 2 m, 23 Oct 1985, 1 ♂ with eggs, 1 juv.

Distribution.—This species has been taken in a number of Indian Ocean localities from Kenya and the Red Sea to Singapore, and it has been found at Enewetak Atoll, Marshall Islands. This is the first South Pacific record, but it probably will be found to inhabit many other western Pacific localities. The Samoan capture depth contributes nothing new to the known depths of intertidal to 5 meters for the species.

Remarks.—The 3 small cement gland cups on each femur serve to distinguish this species from most others known, although it is not the only species to possess multiple cement gland outlets. It has no other outstanding characters except for the closely spaced lateral processes and a long propodal lamina, making isolated females difficult to impossible to distinguish without accompanying males. This species is little different from several other Pacific species except for the cement gland cups which may number from 2 to 4 per femur on the same specimen and for the very long propodal lamina which is another unusual character. The two characters serve to separate this species from any other small but similar species in the western Pacific.

Anoplodactylus perforatus Nakamura & Child

Anoplodactylus perforatus Nakamura & Child, 1982:289–291, fig. 3; 1983:49.

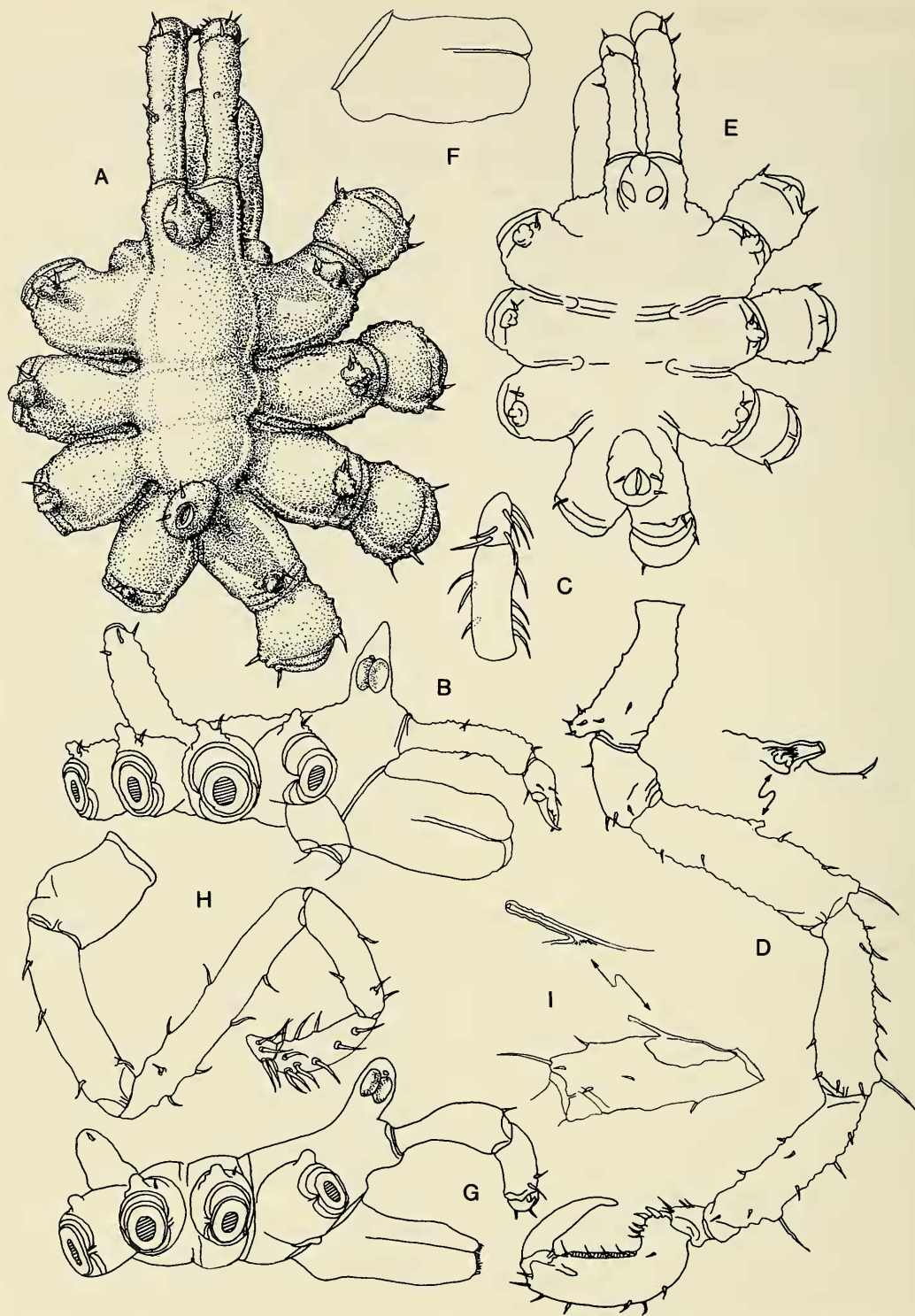


Fig. 2. *Anoplodactylus viridintestinalis*, California male: A, Trunk, dorsal view; B, Trunk, lateral view; C, Oviger terminal segments, enlarged; D, Third leg, cement gland tube enlarged. California female: E, Trunk, dorsal view; F, Proboscis, lateral view. *Anoplodactylus rimulus*, Samoan male: G, Trunk, lateral view; H, Oviger, enlarged; I, Femur, cement gland tube enlarged.

Material examined.—American Samoa: Tutuila; Pago Pago Harbor, dredged in 15 m, 22 Oct 1985, 1 ♂. Western Samoa: Upolu Island; Apia, dredged in 10 m, 25 Oct 1985, 15 ♂ with eggs, 18 ♂, 44 ♀, 1 juv.

Distribution.—This species is very commonly found in large numbers in southern Sagami Bay, Japan (type locality), in depths of 7–15 and 113 meters. Its capture in 2 localities in the Samoa Islands greatly extends its known distribution eastward and to the South Pacific, without expanding its known depth range. The single capture of 78 specimens in Apia emphasizes its tendency to be found in large groups, the same as in many of the Sagami Bay captures. Nothing can be said concerning this gathering of specimens except that sufficient suitable food must be available for such an aggregation to remain grouped in a small restricted area.

Remarks.—This is another species in which males are made distinctive and easily identified by the cement gland openings which number from 17 to 25 pores on each femur, surpassing any other known species in number, and the very long oviger bearing only a tiny terminal segment. Similar species have a terminal segment half as long or longer in relation to the fifth segment, and always have far fewer cement gland openings. Other recognition characters are the very short propodal lamina, measuring less than 0.1 of the sole length, and the long chelae fingers without teeth.

Anoplodactylus rimulus Child

Fig. 2G–I

Anoplodactylus rimulus Child, 1988b, fig. 3.

Material examined.—American Samoa: Tutuila; Pago Pago Harbor, 3 m, 23 Oct 1985, 2 ♂ with eggs, 1 ♂, 2 ♀, 1 juv.

Supplemental description.—(Male) Proboscis tapering only from 0.77 length distally, with marked single proximoventral bulge lacking cleft. Femur less inflated, with cement gland from proximal rim to median dorsal point and cement gland tube, a long

straight tube half femoral diameter situated just proximal to median point. Oviger fairly short, second, third and fourth segments with few short randomly placed setae, fifth with many setae equal to segment diameter placed in rows, sixth a tiny cone with 6–7 setae circling cone, setae as long as those on fifth segment.

Distribution.—The type locality for this species is Aldabra Atoll, Seychelles, Indian Ocean, in 3–6 meters. This is the second record for the species and it greatly extends the known distribution to the east in the mid-Pacific at Samoa. The depth of capture of the Samoan specimens is within that of the Aldabra records.

Remarks.—The elaborate proximoventral tubercles of the females in this species are not carried over to the male to as great an extent. This is true for the so called “alar processes” of many females in this genus, but the male of this species, now known from the Samoan material, does have a single proximoventral bulge on the proboscis. The female proboscis bulge of the Samoan specimens is not as large or elaborate as those of the Aldabra Atoll specimens. It consists of a bulge with a barely perceptible longitudinal cleft but lacks the lateral cleft of the type specimens. All other female characters appear to fall within acceptable bounds of variation as the differences are only slight between the two sets of specimens. The male was previously unknown, but aside from the male characters of oviger and cement gland, it is very similar to the female including length of propodal lamina, heel and sole spination, leg segment lengths, chelae characters, and lateral process tubercles. These tubercles are slightly smaller in the female, as would be expected. The grossly clubbed chelifore scape of this species is rare in the genus and affords a good recognition character along with the ventral proboscis bulges of this tiny species.

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The specimens are deposited in the collections of the National Museum of Natural History, Smithsonian Institution, under the catalog numbers of the old United States National Museum (USNM).

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